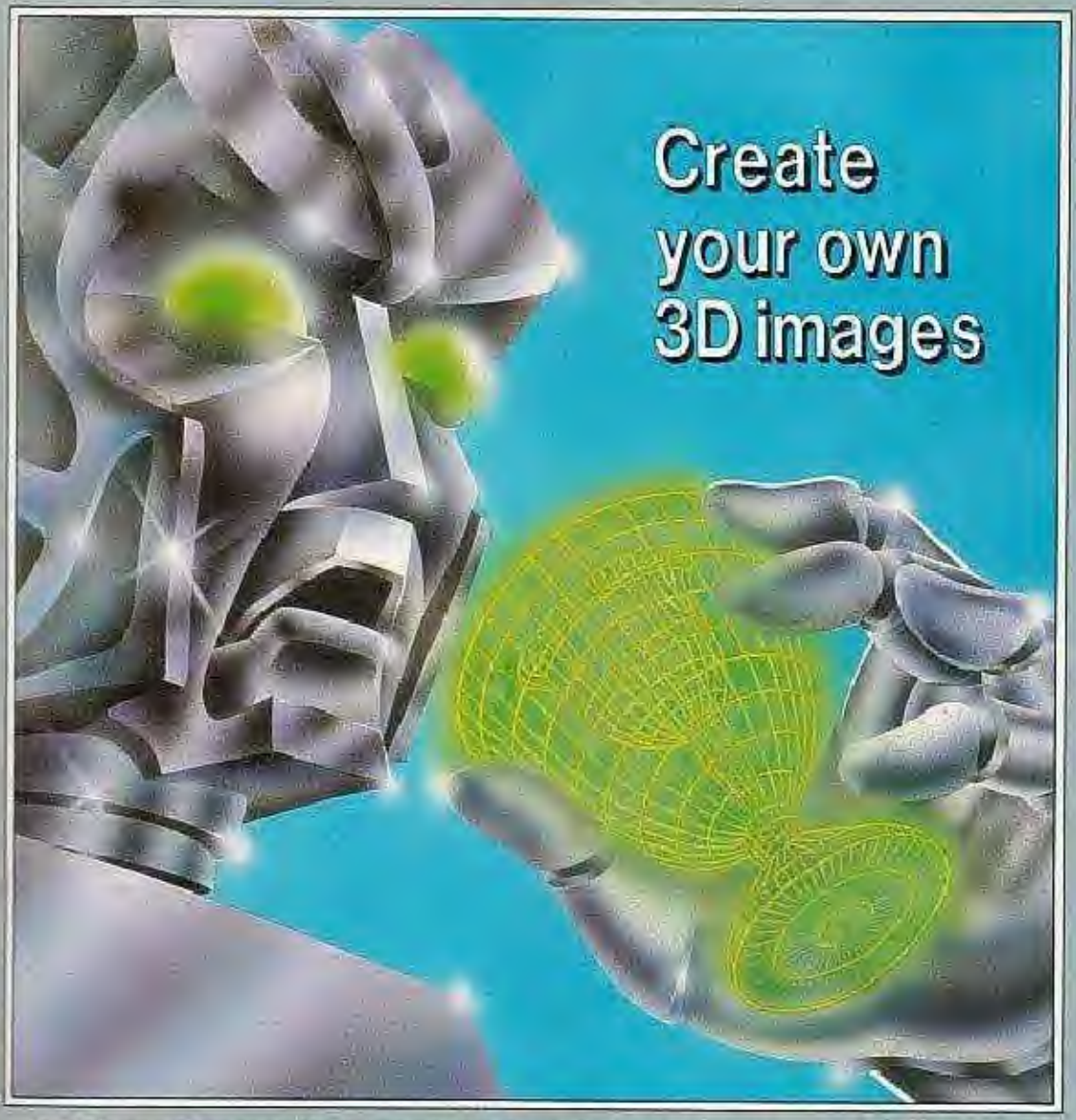
Vol. No. 5 July 1986

Atari ST User



- *Three C compilers analysed and their benchmarks compared*
- *How does the two-player arcade game Time Bandit rate?*
- *Reviewed: Two books that take you inside the ST and GEM*

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Educational BBC due for a caning

MIKE COWLEY reporting

CAN you keep a secret? Well the gossip is that the long standing affair between Miss UK Education Establishment (128k-64k-128k) and live-in lover BBC Micro is heading for the rocks. Apparently – and only *Atari User* and Nigel Dempster are privy to this – she is secretly being wooed by a number of alternative suitors.

There is little doubt that they are influenced by her money – it being a case yet again of never mind the boat race, clock the purse. And no doubt this accounts for the almost indecent bodice-ripping haste involved in the chase.

It will all be to no avail however, for I can now exclusively reveal that she only has eyes for the latest star to appear on the circuit – Mr ST himself.

By carefully projecting his power without the price, he is reported to have already successfully swept her off her feet. The latest titbit is that she'll be booting out rather than up her elderly BBC Micro any day now. But as one wit observed, with his limited memory it shouldn't be long before he's forgotten it any way.

But what do I base all this (nonsense) on? Well the signs are there for all those who are prepared to look. The boys from Acorn have for too long now considered their educational market position unassailable, just as the French did behind the Maginot line.

The trouble was they failed to notice the longing glances being cast by Atari since the Tramiel clan replaced the corporate backbone in the company. Now it may be too late for them to counter attack against the rapid advances Atari has made in this sector of late.

Cleverly deciding to catch Acorn off guard by attacking the top end of the market, Atari launched a pincer movement on the university front.

The company's first breakthrough came when G & B Computer, a London dealer, landed an order for 60 520STMs from City University where the machines will be used to teach programming skills. Only days later, the redbrick University of Sussex fell under the ST onslaught of Brighton Computer Exchange.

And now Atari is knocking loudly on the door of the Open University with a tender for 30,000 computers. With the OU having made it a criteria that any computer bought must be MS/DOS compatible, Atari was able to play its IBM add-on trump card.

"The advantage with this is that we are both PC/DOS and MS/DOS compatible", says Atari UK boss Max Bambridge with undisguised glee. "So with our product more than fulfilling their requirements and at our price, we must be in with a real chance at public tender. With this one under our belt, it won't be long before the ST is the required norm in the UK education scene".

If that wasn't enough to turn the Acorn boys into lemmings, then Atari had to give them a further prod by coming up with a BBC emulator. Written by a freelance programmer, it runs standard BBC Basic at the same speed as the Acorn machine.

It's no wonder that some people at Acorn are growing increasingly concerned that this time it may be the Master that's in for a caning.

* * *

IF you happen to have a friend who has paid out a far larger sum of money for an IBM PC or an Apple II than you have for your ST, try dropping in this little gem at some convenient moment.

Systematics International has recently put its popular accounts suite on the 1040STF. It now turns out that the Atari version runs at three times the speed of its IBM PC counterpart and eight times faster than the one for the Apple II.

* * *

THE ST is increasingly looking better value for money. It all boils down to the price of the first class software now being made available for the machine.

For the 520ST in particular, it would be little short of ridiculous to fork out up to £500 even for such well known packages as dBase II from Ashton Tate. But ST users don't have to because Versasoft has come up with dbMan to do the job at just £170.

And for those who long for the Gone with the Wind of programming – Lotus 1 2 3, – there is the compatible VIP package for the ST which costs less than £200.

* * *

LOOK out for a new super-chip designed to rival the graphics blitter found at the heart of the Commodore Amiga. It is currently being worked on under maximum security at Atari before release in a new ST model later in the year.

Nothing more on the forthcoming machine yet, apart from the fact it will have 2mb of memory and will probably not appear before the end of this year.

* * *

A "CLEANED up version" of Atari's CP/M emulator for the ST is being offered by a dealer down in Essex. The man behind the product – it costs £6.50 including post, packing and VAT – turns out to be former Atari employee Mike Wilding.

It includes one CP/M emulator disc, a utility disc incorporating public domain software and a 14 page manual. The latter is said to overcome "the usual Atari problem" – having the instructions for using the disc filed as a document – on the disc.

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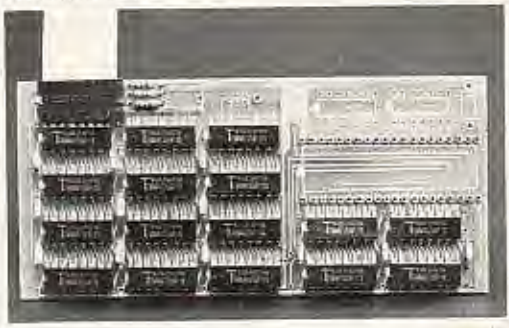

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Facts are well worth waiting for

ONE of the many problems facing users who buy their computer early in its life is the lack of quality programs and reference books. Programs allow users to get the most from their new machines, whereas reference books help them answer some of the many questions that they might have about their new purchase.

One of the first books to arrive for the ST is Harnessing The Power Of Your Atari ST by Tim Hartnell. It is well presented with many illustrative screen dumps and examples. However it is the overall content which lets the book down.

Mr Hartnell has split it into three main sections – Using the GEM desktop, Using Logo and Using GEM Draw. The first section describes how to manipulate such things as files and folders, but fails to say anything which isn't already covered in detail in the ST handbook supplied with the machine.

The Using Logo section is made up of some 90 pages which serve as a useful introduction for the beginner. It is well laid out with plenty of examples, supplying some information which isn't in the Logo handbook supplied with the ST and some information that is hidden deep within the handbook. It is a good introduction to Logo.

The final section explores the use of GEM Draw from Digital Research. This is also well presented with many helpful examples which would be advantageous to all owners of GEM Draw. The question is, how many people actually own this piece of software? Certainly you would not expect the first time user to buy such a product.

This book contains much well thought out material, but it is a pity that there is so little material which isn't already supplied in various manuals. This book would be useful for absolute beginners, but even they would probably out grow it fairly quickly.

I'm sure that we'd all rather wait a couple of months longer for our computer books, so that the authors can include information which isn't already supplied in the handbooks. After all the passing of information from the author to the reader is what a book is meant to do.

Problems, problems.

THERE have been lots of new and varied problems this month. Malcolm Crowe from Glasgow asks where he can obtain the AES and GEM manuals that I mentioned a couple of months ago.

These manuals are part of the Atari software developers' kit. They are not intended to be used by non-software developers and are highly technical and generally user-unfriendly. Another minus is the fact that the developers' kit costs over £300.

All of the information in the manuals is now available in various books from third party publishers, such as 1st Publishing and Compute. I hope to obtain copies of these and shall tell you my views on them soon. *(See also this month's Book Reviews on Page 11.)*

Alan Philips writes from London N9 to ask if the 1040ST is available without a monitor. Alan already has a colour monitor and is trying to save some money by not ending up owning two of them.

If you really need a 1040 without monitor you're probably better off buying a 520STM, adding a double sided disc drive and expanding the memory with a board of the kind that AST sell. This will probably end up cheaper than a 1040 as well. Failing that, if you still desperately want a 1040 you may find a dealer who will split a 1040 package and sell it without monitor.

Alan also wants to know if it's safe to place his disc drives directly under the monitor. The Atari monitors have very high magnetic fields directly around them which can corrupt a disc and therefore make files unusable, causing many hours of work to be lost. For this reason you mustn't store your discs close to your monitor.

The disc drive is shielded against outside fields and so you shouldn't have any problems placing it near your monitor. That said, you won't find my drives anywhere near my monitor. It just isn't worth the risk. It's like storing valuable papers next to a raging fire – one small breeze and up go hours of work.

M. Morgan from Baleares, Spain, asks why the control panel date and time are reset every time he switches on his ST. Unlike the Apple Macintosh the ST doesn't have a built-in battery to keep the clock running when your ST is turned off.

It is possible to build a battery clock circuit for your ST, but if you're not that confident with electronics you might consider buying AST's clock card. This keeps the clock running, so that it's always correct when you turn on your ST.

Mr Ong from Singapore writes to complain that my method for auto running programs using an Auto folder doesn't work. Unfortunately any program that is placed in an Auto folder will be executed before the ST has properly initialised GEM.

This means that GEM isn't available to any program that you place in one. Only programs

→

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that don't use GEM, such as STWriter and some RAM discs, can be auto run in this way. You can place as many programs in an Auto folder as you like and they will be executed in the order in which they were placed in.

Mr Blackwood from Manchester is worried over software compatibility between the various ST models. The ST series is what is known as upwardly compatible.

This means that anything written for the 520ST or 520STM will run on a 1040, but anything written for the 1040 might not work on the smaller machines. At the moment there is very little software that requires the 1040's extra memory, so you shouldn't have any problems with software compatibility.

Brett McBain from Petworth, Sussex, has just upgraded to a ROM system, and is having problems using the control panel. If you try to boot the system using your old System Disc the old system will be loaded in as before, and you will lose 200k and have all of the old bugs.

To avoid this problem you should move the desk accessories and DESKTOP.INF file onto a new disc. You can then use this disc whenever you want to boot the system. Another method is to place the accessories and DESKTOP.INF on all your discs, so that you can simply boot with any disc.

The ROM system also allows you to rename your accessories, as long as they still have the .ACC file extender. Therefore you can rename the supplied accessories to help you remember which accessory file contains which accessories. For example you can rename DESK1.ACC to CONTROL.ACC and DESK2.ACC to EMULATOR.ACC, as Atari has done on the more recent discs it has shipped.

My thanks to Andrew Davidson who informs me that it is possible to reverse the display on a hi-res monitor. This is done by moving the control panel sliders to their bottom position. Having a reverse display may be preferred by some and it certainly makes Megaroids look more interesting.

We at Atari ST User Towers would like to know what languages you have. For example, are there enough of you who own a C compiler to start publishing C listings? In order to answer this problem we need your help.

If you write to me to ask for help on any subject I would also like you to tell me what languages you own and what you think of them. I'll be publishing the results in a couple of months and hopefully your answers will help mould the magazine to your tastes. ■

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Title: The Anatomy of the Atari ST
Authors: Gerits, Englisch, Bruckmann
Price: £12.95
Supplier: First Publishing, Unit 20B Horseshoe Road, Horseshoe Park, Pangbourne, Berkshire RG8 7SW. Tel: 07357 5244

Mysteries no longer..

AT last books are appearing that begin to delve into the internal mysteries of the ST operating system and to supply information not previously available in this country. With this book you can know at a single stroke more than Atari HQ's Hotline does.

Its 446 pages start by looking at the ST's hardware, then move on to cover the various software routines available. It is very much like the Advanced User Guide for the BBC Micro in the areas covered.

The hardware sections explain the ins and outs of the 68000 processor, WD 1772 floppy disc controller, MFP 68901, 6850 ACIA's and YM-2149 sound generator. Also examined are the keyboard and its controller, joystick ports, and all the other sockets on the ST's outer case.

Each item is given a circuit diagram with the various pins named, and background information on the registers used and the commands available to program it. The keyboard control routines are especially useful, allowing you to control the joysticks and mouse.

Perhaps the most useful section for the ST machine code programmer is the software section. This starts by looking at GEMDOS and all the different machine code calls available. Each command is described in detail with examples given where necessary. Since GEMDOS controls input/output routines and disc operations it is a powerful tool to acquire. BIOS (Basic Input Output System) and XBIOS are described in much the same way, in some cases overlapping with GEMDOS in function. Routines included in this section include calls to control the MIDI and RS-232 ports, and random number generators.

The next section is all about the Command Line A interpreter – a grand title for something that is a quick way into the vastly complicated graphics system. Fifteen routines are listed, and these allow you to do such things as redefine the shape of the mouse, draw software sprites and lines, fill in simple graphic shapes and move blocks of memory around. A few more examples might have helped the reader to understand all that was going on here.

Exception vectors and interrupts are covered next. For anyone who fancies writing machine code routines to handle text, the VT52 emulator section is a must, with its listing of each text controlling routine.

The final two informative sections list all the useful memory locations plus a brief explanation of programming the 68000 processor. The former section gives the locations of such useful items as the start of free memory, start of screen memory and the system clock.

The remaining 80 pages give a complete breakdown of the BIOS listing. This section seems an excuse to pad out the book as it is useless to me as a programmer. It is quoted in the book as being valuable, but not why it is so. I have yet to find a use for it.

Verdict: A superb book, aimed at anyone who wants to delve further into machine code and use the routines that the system supplies. This is the book I have been waiting nearly six months for.

Stephen Underwood reviews two books on the ST

The inside story of GEM

Title: Gem on the ST
Authors: Szczepanowski and Gunther
Price: £12.95
Supplier: First Publishing, Unit 20B, Horseshoe Road, Horseshoe Park, Pangbourne, Berkshire RG8 7SW. Tel: 07357 5244

GEM is the built-in software on the ST that controls such things as the text windows, drop-down menus and the mouse. It also controls a host of graphic drawing routines and text presentation. This book describes GEM in detail then goes on to look at each of the various GEM calls in turn.

As such it is vastly useful, supplying

information which is normally contained in the £325 GEM manuals, but is not so easy to use because none of the routines are written in Basic.

What the book does cater for is the machine code and the C programmers. However I should say at once that while the C programs work fine, I have yet to get one machine code program to do anything at all except produce errors with my assembler.

It would appear that the key initialising routine was either written for an earlier version of GEM or contains a fatal error somewhere in its listing. This is frustrating since I bought this book to use at the machine code level.

It starts by looking at GEM in an overview, and its two major divisions, the VDI and the AES, then goes on to explain how to use the programs in C and in machine code. This is fine, but the machine code section is not too clear and both explanations assume that you are in possession of the £1000 plus software package issued to software houses when the ST first came out. Rather a limited audience to aim at I would have thought.

Next come two massive sections describing all the VDI (Virtual Device Interface) and AES (Application Environment System) routines. Each is described in detail, the various variables used are listed as well as the information needed to include each routine in 68000 and C calls. In addition some complex examples are given at the end of each section explaining briefly what each routine does and what should result.

I feel that as a source book of information on the GEM calls this is hard to beat, but lets itself down on that most important of areas explaining to Joe Public how to use those routines himself. ■

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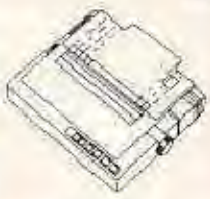

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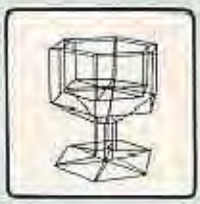
A Basic route to 3D drawings



By GRANT OWEN

MANY simple drawing and doodling programs have been written for the ST. Now here is a short Basic one which will allow you to draw a shape and then convert it to 3D, even allowing you to look at it from varying angles.

Type in the listing, and save a copy on disc. When you run it simply follow the instructions on screen. To define the shape point the mouse and click on the left button. Now move the pointer to the next point you require, and press the button again.

Continue this process until you have finished your flat design – see Figure I – and then press the right button. You will then be asked how many faces you require the finished drawing to have. The maximum allowed is 50, which gives a very well defined circular drawing effect.

When all the calculations have been done the next question is the angle of view. Figure II shows the half-drawn shape with an angle of 0.5 selected, and Figure III shows the completed drawing. Figure IV shows the same design, but with an angle of 0 – in other words a cross-sectional view.

The program was written on a monochrome monitor, but should work in the colour modes by reducing the 320 offset value – see lines 770-790, for example.

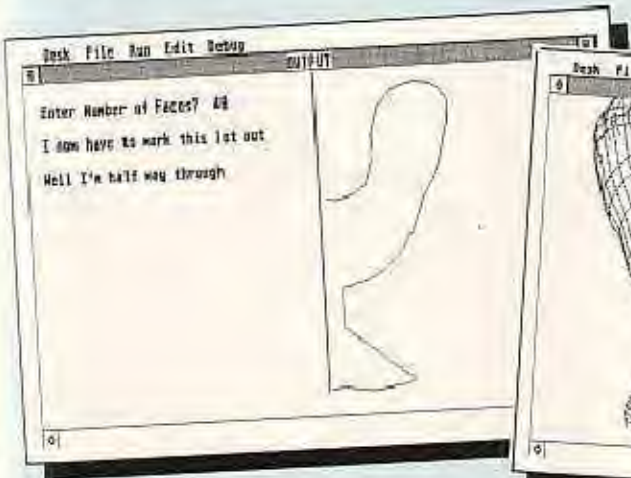


Figure I

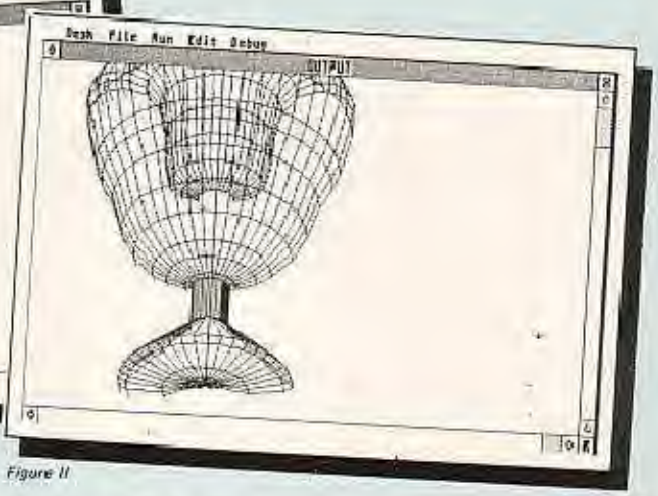


Figure II

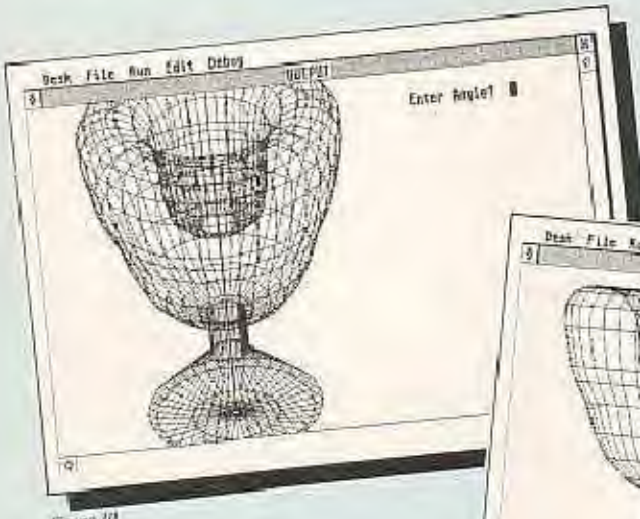


Figure III

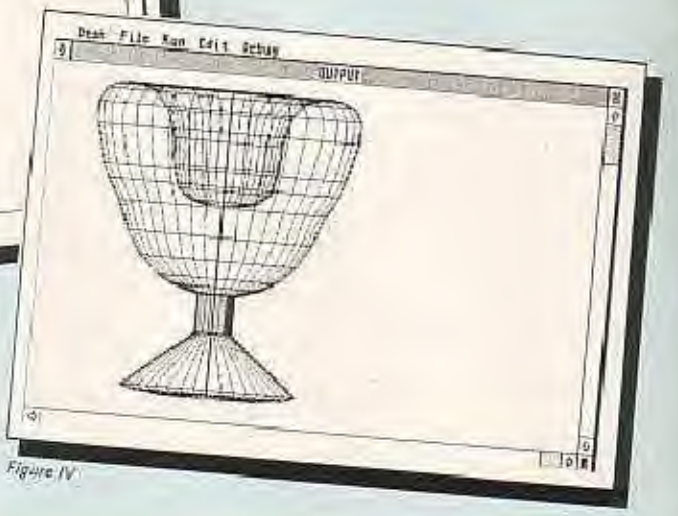


Figure IV

```
10   rem ******** 3D DRAWER by B.Owen **********
20   fulw 2
30   gosub gemini: rem initialise mouse etc
40   max1=50:dim x(max1,50),y(max1,50),z(max1,50):rem set dimensions
50   clearw 2:gotoxy 10,3:?"Welcome to 3D Drawer"
60   gotoxy 13,7:?"Press Any Key to Continue"
70   gosub scan:clearw 2:rem scan keyboard-clear screen
80   dx=320:dy=250:xpoint=0:xpi=3.14159:2:rem starting point on screen
90   linef 320,1,320,720:rem vertical line to split screen
100  gosub getmouse:rem get x,y and buttons from mouse
110  if mk=1 then gosub store:rem if left button then store x,y point
120  if mk=2 then goto show:rem if right button then work out data for display
130  dx=mpx:dy=mpy:rem data x,y= mouse x,y
140  if point >0 then gosub fline:rem draw line from the first point
150  goto 100
160  show: gotoxy 1,1:input "Enter Number of Faces";f:rem get number of faces
170  gotoxy 1,3:?"I now have to work this lot out"
180  if f >49 then f=49:rem no more than 50 points
190  sn=sin(pi/(f/2)):rem get circular functions
200  cs=cos(pi/(f/2))
210  for i=0 to f+1
220  if i=f/2 then gotoxy 1,5:?"well I'm half way through"
230  for k=1 to point
240  x(k,i)=x(k,i-1)*cs-z(k,i-1)*sn:rem point to x co-ord
250  y(k,i)=y(k,i-1):rem point to y co-ords
260  z(k,i)=z(k,i-1)*cs+x(k,i-1)*sn:rem point to z co-ord
270  next:next:clearw 2:gosub display:if nn=99 then goto 50
280  gosub scan
290  clearw 2:goto 80
300  store: point=point+1:rem increment pointer counter
310  flag=1
320  gotoxy 1,1:? point;' points set':rem display each time left button pressed
330  x(point,1)=dx-320:rem store x co-ord
340  y(point,1)=dy:rem store y co-ord
350  z(point,1)=0:rem store z co-ord
360  gx=x(point-1,1)+320:gy=y(point-1,1):rem last point
370  gx2=x(point,1)+320:gy2=y(point,1):rem this point
380  if point >0 then linef gx,gy,gx2,gy2:rem draw line
390  if point=max1 then goto show:rem if more than 50 then draw in 3D
400  return
410  scan: key=inp(2):if key=27 then end else return:rem get key if esc then end
420  display:gotoxy 1,1:input "Enter Angle";nn
430  clearw 2
440  if nn=99 then return:rem enter 99 to go back to begining
450  for i=1 to f
460  for k=2 to point-1
470  h=320+x(k-1,i)
480  j=y(k-1,i)-nn*z(k-1,i)
490  n=320+x(k,i)
500  m=y(k,i)+nn*z(k,i)
510  linef h,j,n,m:rem draw the lines in 3D
520  linef n,m,320+x(k,i+1),y(k,i+1)-nn*z(k,i+1)
530  next
540  next:goto 420
550  return
560  getmouse: rem get x,y and button state
570  gemsys(79)
580  mpx=peek(gintout+2)
590  mpy=peek(gintout+4)-32
600  mk=peek(gintout+6):rem button state
610  if flag=1 and mk=1 then mk=0:return
620  if mk=0 then flag=0
630  return
640  gemini: a0=gb:rem initialise gem array variables
650  control=peek(a0):rem not all of them are used
660  global=peek(a0+4)
670  gintin=peek(a0+8)
680  gintout=peek(a0+12)
690  addrin=peek(a0+16)
700  addrout=peek(a0+20)
710  poke gintin,5:rem change mouse to cross hair
720  gemsys(78)
730  return
740  fline:
750  if mpx=mpx and mpy=mpy then return:rem if mouse not moved don't bother to dr
760  color 1,1,0:rem line now white
770  linef x(point,1)+320,y(point,1),mpx,mpy:rem rub out old line
780  color 1,1,1:rem line now black
790  linef x(point,1)+320,y(point,1),mpx,mpy:rem now draw new line
800  mpx=mpx:mpy=mpy:rem get x,y co-ords for measure next time
810  return
```

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2) TOS - *Tramiel Operating System (in ROM)*
3) 1st WORD - *Word Processor by GST using the GEM environment and multiple windows*
4) BASIC - *Personal Basic by DR (with manual)*
5) LOGO - *Logo language by DR (with manual)*
6) DOODLE - *Simple paint doodle drawing package (works on mono or colour systems)*
7) MSGAMDOS - *Asteroids type game by Megamis*
8) NEOCHROME - *A powerful colour paint and graphics package (only useable with colour systems)*
9) CP/M EMULATOR - *Allows the use of DR's Zilo C/PM software to run on any ST system*

3rd PARTY SUPPORT

The power and potential of the ST range of computers is causing a flood of new software titles, peripherals and accessories from third party manufacturers. Titles range from word processing to spreadsheet programs, from graphics and games to database management - all with those very drop-down menus and windows. With the list of companies producing ST software including dozens of top names, you can expect some first class titles for the new ST range. The following includes a selection of the third party manufacturers who have developed, or are working on, products for the ST range:

ABACUS	EXTENDED SW	MICRO-ED INC	ROBINSON SYS
ACADEMY	FIDELITY	MICROPRO	SCARBOROUGH
ACCOLADE	FIRST BYTE	MICROPROSE	SIERRA ON LINE
ACTIONSOFT	FIRST FORM	MICRO-WORLD DIST	SM SOFTWARE
ACTIVISION	FLIP 'N' FILE	MIGRAPH INC	SOFTEK
ADVENTURE INT	GOLDSTAR PRINT	MILES COMP	SOFTLABS
ANTIC	GST SYSTEMS	MIRACLE	SOFTLOGIK
AMERICAN COVERS	HABA	MIRAGE	SOFTWARE GEMS
ARTWORX	HAYDEN	MISSIONWARE	SPECS
ASHTON TATE	HIPPO	MONARCH DEV	SOFTWARE PUNCH
ATT	HOCHT	MOSAIC	SOFTWORKS
AUDIO LIGHT	IMPRESSION	MULTIFORM	SONDRA ED
AZTEC	INSIGHT	MULTIMATE	SPINNAKER
BATTERIES INC	INSOFT	OSS HK	ST AVE TERM
BAYTEN	ISLAND LOGIC	OVER	STOCKWARE
BECKEMEYER	KNOWLEDGEWARE	PANTHENIS	SUB LOGIC
BETTER WORKING	KUMA	PDS	SUNDATA SERVICES
BLUE CHIP	LASE RIGHT	OTHER VALLEY	SUNSHINE SOUND
BOS	LEARNING	QUIC	SUPERMONITOR
CADAM INC	LEVEL 9	PAPER LOGIC	SYNTHETICS
CHANG LABS	LEXIKRAFT	PARADOX	TALENT
CHELTON SYST	LLAMASOFT	PENGUIN	TDI
CHIPSOFT	LOMICOMPUTER	PHILON	TEL ARTUM
COMPUTER	MANTRAX CORP	PLANNER	TK COMPUTER PRO
CROSSBOW MUSIC	MAP COMPUTING	PLANTRA	TOP EXPRESS
DATABUSCH	MARC M LINCOLN	PROGRESSIVE	TOWNSEND
DATA CODE SYS	MARK WILLIAMS	PROSPERO	TYNESOFT
DATA SYSTEMS	MARTIN DONG	PSYCHOLOGY	UNISON
DELTRON	MICHAEL HILL	PSION	VIP
DELTRUM PRESS	MEGAMAS	PSYGNOSIS	WILSON MICROCHIP
DRAGON GROUP	MEMORIES	QUICKVIEW SYS	WHITEHALL
DUNCAN PUBNG	METACOMCO	RAINBIRD	WINDHAM CLASSICS
ELECTRONIC ARTS	MICHTRON	REGENT	WORD W ORD COM
ESCOM	MICRODEAL	REVOLUTION	XLENT

520ST-M

NEW 512K 520ST-M KEYBOARD: The new 520ST-M keyboard costs only £349.99 (+VAT = £399.99) and is yet another price breakthrough for Atari Corporation. The keyboard now includes both an RF modulator and mouse, allowing you to connect it to an ordinary domestic television set. In addition, the keyboard is supplied with 512K RAM, a mouse and a free set of 3½" disks containing applications software. The TOS (operating system) and the GEM graphics package are now supplied on ROM (Read Only Memory) chips which are already installed in the keyboard. This means that the operating system will automatically load in when you switch the power on. In addition to the keyboard, you will also need to purchase either a 1Mbyte SF354 disk drive (£189.99 +VAT) or a 1Mbyte dak drive (£194.99 +VAT). Either disk drive will provide you with fast data storage facilities and a vast amount of storage space. If you prefer not to use your own TV set, you may connect your ST to a monitor. This may purchase the Atari SM124 monochrome monitor (£99.99 +VAT), or use of Atari's two Thomson colour monitors. Alternatively, you may choose one of the many third party monitors which are available.

NEW 1024K 520ST-M+ KEYBOARD: In addition to the standard 520ST-M we have a new keyboard which we are calling the Atari 520ST-M+. The M+ is a 520ST-M keyboard which has been enhanced by a third party RAM upgrade to 1 megabyte of memory. The 520ST-M+ is available from Silica at the retail price of only £433.91 (+VAT = £499). This product will provide you with an alternative to the 1040ST-F, but at a lower price. Additionally, it features the advantage of the 520ST-M's built in modulator.

£347

1040ST-F

For the businessman and the more serious home user, Atari have introduced the 1040ST-F, a low cost powerhouse which can be introduced to a business environment as a stand-alone system, or can support a multi-user computer as a terminal. The new and bespoke 1040ST-F enhanced Atari has an excellent reputation in the marketplace as it is the first personal computer available with one megabyte of memory for less than £900. You can purchase the 1040ST-F as a mono or colour system. The heart of the monochrome system is the SM124 VDU (£99.91+VAT = £114.89). With the colour system at only £999 (+VAT = £1148.85). The new 1040ST-F not only features twice as much memory as the 520ST-M, but also includes a one megabyte double sided disk drive and mains transformer, both built into the console to give a compact and stylish unit with only one mains lead. The 1040ST-F is also supplied with a free software package. Unlike the 520ST-F, all 1040ST-F's are manufactured every week in the latest specification and are built to the highest quality. Therefore you can rest assured that your 1040ST-F will be free from teething problems. Call into your nearest branch for a demonstration.

1-4 The Mews, Hatherley Road, Sidcup, Kent, DA14 4DX
157 Drpington High Street, Orpington, Kent, BR6 0LG
Lion House (1st floor), 227 Tottenham Court Rd, London, W1
Selfridges (1st floor), Oxford Street, London, W1A 1AB

£799

THE ATARI EXPLOSION!

If you are the proud owner of one of the new Atari ST computers from Silica Shop, you will have noticed that there is one company which is getting a large slice of external space in the newspaper that contains Atari Corporation. Atari have been making big news since the launch of their new 16/32 bit range of ST computers. Led by the powerful figure of Jack Tramiel and under the banner "Power Without The Price", Atari are manufacturing new computers instead of power, with the power to challenge more established market leaders. With the introduction of IBM compatibility, a CP/M emulator, a powerful new working system and a communications package by Xiet, now the 'real' powerhouse, is upon us. It is not an 'any fellow feels' as an explosion of the magnitude which will see Atari placed firmly beside such names as IBM and Apple in the personal computer marketplace. Read on for more details of what Atari are doing and how they are pushing the 'Power Without The Price' computers beyond the reach of the pocket book.

FREE CP/M EMULATOR

The newly announced CP/M Emulation Package will enable software written under Digital Research's 280 CP/M operating system to be run on the ST family of computers. There are several thousand applications written for CP/M in the U.K. alone, and several of the major CP/M software developers have already converted their programs to 3½" disk format for the ST range. The CP/M emulation package is supplied FREE OF CHARGE by Silica Shop with all ST computers.

IBM COMPATIBILITY

To make the ST available to those businesses who currently run IBM systems we are looking for a low cost expansion method. Atari have announced a co-processing card for ST computers. This processor will open the ST range of IBM or IBM compatible software applications. The unit, which attaches to the ST computers via the DMA (Direct Memory Access) port, contains an Intel 8088 processor with 512K of RAM and will access a 5¼" disk drive. It is the ST's version of an IBM AT. Silica Shop are offering this unit at only £499 (+VAT = £574.85). Please note that the unit will not be available until June. Please do not order your unit at present as we do not wish to take your money for a unit which will not be available for some time. Please wait for our confirmation that the unit is available before ordering. Please complete the coupon below if you would like to be informed when it is released.

20Mbyte HARD DISK £739

The new Atari hard disk for the ST range has just been released. All ST computers already have a hard disk interface built into them so there is no external interface required. The memory size of the disk is a massive 20 megabytes (unformatted), with a data transfer rate of 5.0 Mbytes per second. At a price of £739 (+VAT=£849.85), the hard disk offers massive storage with fast access over reasonable price.

NEW ST SOFTWARE PACKAGES

There are now hundreds of software packages which have been announced for the Atari ST range. Titles are becoming available all the time as well as the 3 D Base, a Cobol II compiler, an assembly/PC emulator, a VT100 emulator which enables you to use any ST keyboard as a terminal connection to a mainframe or mini. Other programs include a Lotus 1-2-3 clone (see paragraph below).

VIP PROFESSIONAL - LOTUS 1-2-3™ CLONE

This is probably the most impressive program to have been released so far on the ST range. VIP Professional is an extremely easy to use, integrated spreadsheet, database and graphics program which is identical both in features and commands to Lotus 1-2-3™. The base spreadsheet contains information management and networking functions as standard. Supplied in one ready to use, affordable package, it has a more VIP Professional is not to be confused with 1 Dot 1-2-3™, as it is not! It has, but in short, Lotus 1-2-3™ for the IBM PC/AT costs £782 (+VAT=£894.25), whereas VIP Professional for the ST is a mere £469 (+VAT=£534.22). That's less than half the price! If you would like further details on VIP Professional, please complete the coupon below.

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The new 1M

With a memory like
we haven't for

Mb 1040STF

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rgotten a thing

The Atari 1040STF employs state of the art 16/32 bit technology. Yet its price is unbeatable.

The ST range of computers already has a large number of software programmes available, including word processors, spreadsheets and databases, as well as a variety of programming languages and specialist business packages.

The 1040STF will also run software written on several other popular operating systems, including CP/M.

It has a 1024K RAM, integral 1Mb (unformatted) double-sided 3½" disk drive, two-button mouse and built-in power supply.

The operating system is in ROM, leaving RAM free for applications. BASIC and LOGO programming languages complete the package.

With 12" monochrome monitor, we recommend it sells for £799 excluding VAT saving you at least £1600 against its nearest rival. The price of our 14" colour system is a remarkably low £999 excluding VAT.

As the American magazine 'Byte' commented, "for some time to come the 1040STF will be the clear leader in price/performance."

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And that includes an unbeatable price

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TELECOM GOLD

No. 11 July 1986

NEWSLETTER

Scoop from Japan

ONE of the first reports of the arrival of Prince Charles and Princess Diana in Japan on their recent visit, came direct to the UK from a MicroLink subscriber, beating some of the international news agencies to the punch.

Journalist Yuichi Ishikawa timed his message 12.00 BST, 8 May 86, with the subject matter in capital letters: "WELCOME ROYAL COUPLE TO OUR COUNTRY".

He even took time to design on his terminal two flags – the Rising Sun of Japan and the Union Jack.

His message read: "I Japanese subscriber of MicroLink honour to report the Royal Couple from UK landed safely at Osaka International Airport now. We are pleased their visit. Weather: fine. Temp. 70 degF.

"She wear white one piece. Grandson of Emperor, Hironomiya, meet at airport. Today they will stay Kyoto, beautiful old capital of Japan. I wish they see not only traditional Japan but also High Techs.

"Now weather is getting rainy. Did they come with bad weather of England?" he joked.

Exporters pick MicroLink

ONE of Britain's leading import-export organisations has chosen MicroLink as the communications medium for its near 10,000 members around the world.

The prestigious British & Overseas Institute of Import Export Traders is a totally non-profit association run solely by its members who volunteer for election as officers.

It was founded in 1972 by a group of small companies and individuals who pooled their resources and knowledge to start a joint export sales drive to promote their respective products in Europe.

From this small beginning the Institute has grown to be a highly respected organisation with members all over the world.

"As its main function is to bring exporters into contact with overseas importers, it is a logical progression to require a quick and efficient standard means of communication", a spokesman said.

"As a result of this requirement the products and services committee of the Institute recommended all members to start using electronic mail".

Bill Vickerman, chairman, and Bob Pinder, senior exports consultant – both based in Liverpool and already MicroLink users – said they chose MicroLink because it was reasonable in cost and highly effective in its means of communicating with members.

"It is a quick means of spreading the information that our members need to conduct their business efficiently", said Mr Vickerman.

"It is also a British service that is constantly bringing out new and better means of communication and in its way is a vital aid to our continual search for further British export trade".

Key in for world's hotels

MORE good news about the International Official Airline Guide, which was added to MicroLink's growing list of value added services last month.

As well as supplying the very latest data from more than 750 airlines worldwide – with details of 1¾ million flights – and ensuring trouble-free and more economical flight arrangements, OAG also takes the strain out of choosing a hotel at the other end of your journey.

The same source that provides you with unbiased, up-to-date flight and fare information now brings a world of hotel and motel listings to your computer terminal.

Through the medium of MicroLink you can press a few keys and view over 17,000 North American hotels, more than 9,000 in Europe and 3,000 in the Pacific area.

You simply tell the OAG Electronic Edition the city you're going to and the location you prefer – near the airport, downtown or in a nearby suburb or resort – and in seconds you get a comprehensive alphabetical listing of hotels and motels in the location you've selected.

These come complete with name, address, telephone numbers, range of room rates and quality ratings.

Opening the golden door

MEMBERSHIP of MicroLink doesn't just mean access to its broad range of communications and other value added services. It also opens the door to a wealth of information on the host Telecom Gold system.

The main MicroLink menu makes it simple to dial up the many fascinating databases on Telecom Gold.

Latest addition to the list is World Reporter, a massive full-text database of international news, current affairs and business information, operated by Datasolve.

Its sources include some of the world's leading news gatherers including the Financial Times, Washington Post, The Guardian, The Economist, New Scientist, News Service of Japan, TASS from the USSR and the BBC.

YOUR chance to join MicroLink – Page 45

C A language to harness the ST's sophistication

Peter Connors reviews three C compilers

THE ST is here to stay, and with it comes computing sophistication with an immense potential to unleash the power of professional computing languages to the home user.

"So what?" I hear you say, and the answer is that applications which seriously attempt to tap even part of the ST's power will have to use a language which lets it off the leash.

This is where C comes in. It is a structured language of great power used to write a huge range of software, including operating systems, interpreters, databases and even Megaroids. Importantly for us Gem and TOS routines for the ST are documented in C. More important still, software written in C has greater portability to another machine than if a Basic or 68000 assembly language were used.

Need more convincing? Think about this – portability is saving us money right this very minute. Why? A lot of the languages now available for the ST are existing packages for other machines. Stuff that runs on a 68000 in a Macintosh will run on an ST with very little juggling. Even software for the IBM will transport across to the ST as long as it is written in a portable language like C and it isn't hardware-specific.

And here's the payoff – all those Macintosh and IBM users paid up to £300 or more for their software. That means the publishers have most likely got their program development costs back before they arrived on the ST market and can thus make the ST price lower – and lower still, because how can you charge IBM rates for an Atari-priced bundle that throws in free software?

With software charges held in check by low hardware costs the era of inexpensive but powerful software has arrived. There are lots of cheap goodies on the way.

This review is of three C compilers – from Digital Research (as supplied with the ST Development Pack), the Cambridge company GST, and Lattice C from Metacomco. Unlike interpreters – the Basic in most micros is an interpreted language – they need to have source code written, then compiled in one or more steps and then linked to a library of ready-compiled routines for those functions frequently used.

The result is a program locatable anywhere in memory which you find as a .PRG file on your ST discs. This process is called development and it is gone through many times in arriving at a new piece of software. In looking at compiled languages you need to know how close to the language standard it gets, how easy it is to compile, how small the .PRG module is and how fast it runs.

The latter is familiar as a benchmark time, but shouldn't be looked at in isolation – compilers that produce faster times than others sometimes need more memory and more patience during development.

I've tried to compare all these factors for the products under review in such a form that comparisons may be made with the performance of compilers on other machines. Purists argue

```
/************/
/*  start  */
/************/
long time, *ticks = 0x4BA;
printf("\nPress a key to start:");
getchar();
Super(0);
time = *ticks;
```

```
/**********/
/*  end   */
/**********/

time = *ticks - time;
Super(0);
printf("\nTicks = %d",time);
printf("\nPress a key to exit:");
getchar();
```

```
/************/
/* empty.c */
/************/

#include "stdio.h"

main()
{
}
```

The 'Start' and 'End' source files, plus a null statement program to test the compiler's overheads

that benchmark results aren't comparable because, for example, one version of C might use a 32 bit value for ordinary integer variables where another uses a 16 bit value, but I've used the default size of int for the C under test.

This was 32 bits for Lattice and GST but 16 for DR, giving it an advantage in those tests where variable length is important. I've tried to point out some of the effect this has where it occurs.

An additional point to look for where a compiler has been developed on another machine is the size of memory it will handle without extra commands – because the IBM processors only look at memory in 64k chunks some compilers need you to add steps if you want to address memory further away than the 64k titbit you're in.

To show just how fast the ST goes with the right language I repeated the sieve using register variables where the package supported it: when you look at the times remember that an IBM AT running Digital Research C takes 3.71 seconds and even a VAX-11/750 needs 2.41.

A mixture of standard routines were used for the benchmarks – the listings were as shown, with minor variations to accommodate the GST C.

Empty compiles a C program containing nothing but a null statement in order to see how big a program module is needed just for overheads.

Sieve is famous Sieve of Eratosthenes done 10 times for prime numbers up to 8190. Although the ST's 32 bits will take the search an awful lot higher this low value was chosen to allow comparison with weedy machines.

Fib is a Fibonacci series done 10 times up to the 24th value – again an old favourite in the benchmark stakes.

Frame performs a FOR loop 10,000 times.

Float performs some decimal point maths 10,000 times.

Intmath is a x10,000 looped series of integer arithmetic routines mixed with some bit-shifting.

Pointer uses C's powerful indirection pointers to set the value of a 128 character array 10,000 times.

Savage loops a bunch of trig functions 2500 times to check accuracy – in a perfect world the answer should be exactly 2500.

It is noted where a test was impossible to perform. Some comparisons were made with the ST Basic – where I managed to remain awake before a benchmark finished. Times are accurate to five milliseconds and to get them the ST's 68000 was put in to user mode in order to access the 200Hz system tick via a C pointer to protected memory at $4BA.

See the Start routine listing for the details – this and an End routine were put into each benchmark as an include file and the program size figures thus include this code. All times are in seconds and .PRG sizes in bytes. Compile times are for a complete compile and link cycle.

For a number of reasons it took longer to produce these results than it should have – my disc-based TOS was such an early version it kept bombing after repeated development cycles, my one double-sided drive was barely adequate – you really need at least two single-sided drives or one and a RAMdisc to compile with ease, then I had to add another half megabyte of memory to use a RAMDisc with a disc-based TOS. Once my TOS was a Version 19 in ROM I had no problems.

Digital Research C

DR's C came as part of a preliminary version of the multi-disc Development Pack for the ST. It is expensive, about £400, but includes a pile of other information and software essential to the serious developer – not least of which is a full set of Gem documentation.

Although the other Cs had Gem functions in their library they didn't have this full documentation, probably because the mountain of paper needed takes longer to write than the compiler. Even so the DR paperwork left a lot to be desired in this incarnation. The pack didn't include an editor so the editor supplied with GST C was pressed into service.

Compilation is run by a batch program which invokes a three-pass compiler and then an

```
/************/
/* sieve.c */
/************/

#include "stdio.h"
#include "osbind.h"

#define SIZE 8190

char flags[SIZE+1] = {0};

main()
{
int i,prime,k,count,iter;

#include "start"

for (iter=1;iter<=10;iter++)
  {
   count=0;
   for (i=0;i<=SIZE;i++)
    flags[i]=TRUE;
   for (i=0;i<=SIZE;i++)
    {
     if (flags[i])
     {
      prime=i+i+3;
       for (k=i+prime;k<=SIZE;k+=prime)
        flags[k]=FALSE;
       count++;
     }
    }
  }
#include "end"
```

The famous Sieve of Eratosthenes, run 10 times for prime numbers up to 8190

assembly stage. A further batch step allows linking to the libraries of C, Gem and floating-point functions, before producing a relocatable .PRG module. Comprehensive error messages are available and a step for deleting intermediate files is included.

It was all a bit fiddly but produced compact, fast-running .PRGs, except while using the floating-point routines when the phenomenally fast times were revealed to be the result of incomplete implementation of the maths functions.

Single precision results were always produced when doubles had been requested, tan and atan functions weren't available, and even when they had been left out of the Savage benchmark it came up with a dismally inaccurate result at least 1000 out.

Although I suspect later versions of the DR C will be improved my experience so far with ST Basic indicates similar results – suspiciously fast double precision arithmetic and wild inaccuracy on the Savage benchmark.

Lattice C

Metacomco markets Lattice C, an established and widely used product for other machines, at £99.95 for the ST. It comes on two discs supplied with a clearly laid out and lucid paperback handbook and includes functions for Gem routines and for accessing GemDOS, TOS and the BIOS, but these are less comprehensively defined than the standard C functions for the paper mountain reason. It comes with a screen editor employing a comprehensive set of commands.

A batch program is again used for the two-pass compiler which generates a list of messages when errors occur. There is an option to compile into a form which may either be linked

```
/**********/
/* fib.c */
/**********/

#include "stdio.h"
#include "osbind.h"

#define NTIMES 10
#define NUMBER 24

main()
{
 unsigned int value;
 int i;

#include "start"

 for (i = 1; i <= NTIMES; i++)
  value = fibi(NUMBER);

#include "end"
}

fibi(n)
 int n;
{
 if (n>1)
  return (fibi(n-1) + fibi(n-2));
 else
  return(1);
}
```

A Fibonacci series, done 10 times to the 24th value

```
/***********/
/* frame.c */
/***********/

#include "stdio.h"
#include "osbind.h"

#define COUNT 10000

main()
{
int i;

#include "start"

 for (i=0; i<COUNT; ++i)
  {
  }

#include "end"
}
```

A FOR loop performed 10,000 times

```
/***********/
/* float.c */
/***********/

#include "stdio.h"
#include "osbind.h"

#define CONST1 3.141597E0
#define CONST2 1.7839032E4
#define COUNT  10000

main()
{
 double a, b ,c;
 int i;

#include "start"

 a = CONST1;
 b = CONST2;
 for(i =0; i < COUNT; ++i)
  {
   c=a+b;
   c=c/a;
   c=c*b;
   c=c/a;
   c=a+b;
   c=c/a;
   c=a*b;
   c=c/a;
   c=a*b;
   c=c/a;
   c=a+b;
   c=c/a;
   c=a*b;
   c=c/a;
  }
#include "end"
}
```

10,000 Floating Point Calculations

by the Digital Research linker or by the supplied GST linker program. Development was very smooth and the fastest of the three packages tested. It needed less passes than the DR C and generated less intermediate files.

This is important if you are running your disc close to its maximum capacity – development stops with an Unable to open file XXX type of message. Lattice was closest to the Kernighan and Ritchie language definition of the three tested, with almost imperceptible differences to standard C.

Program modules weren't quite as small as DR but they ran nearly as fast, even though Lattice used the ST's natural 32 bit integers compared with DR's (IBM-orientated?) 16 bits. By declaring any int as a short in the Sieve Lattice shaved 0.6 seconds off. The change was even more spectacular with Intmath, where the time was chopped by a factor of eight.

This was the only C under test where floating point was properly supported, so that I couldn't compare it with the other two. Accuracy was high on Savage at 2499.99999968363 and the Float routine was at least two and a half times faster than comparable Cs on the Macintosh. I liked Lattice immensely.

```
/**************/
/* intmath.c */
/**************/

#include  "stdio.h"
#include "osbind.h"

#define COUNT 10000

main()
{
int i,j,k;

#include "start"

 for (i=0; i<COUNT; ++i)
  {
   j=240; k=15;

   j=(j*4)|(j/8);
   j=(k*j/5);
   j=(j*4)|(k*k*k*k*k*k*k*k*k*k*k*k*k*k*k*k);
   k=(j-k-k-k-k-k-k-k-k-k-k-k-k-k-k-k);

   j=(j<<4)|(k<<4);
   j=(k*(j/k));
   j=(k*(j/k));
   j=(j*k)*(k*k*k*k*k*k*k*k*k*k*k*k*k*k*k);
   k=(j-k-k-k-k-k-k-k-k-k-k-k-k-k-k-k);

   j=(j<<4)|(k<<4);
   j=(k*(j/k));
   j=(k*(j/k));
   j=(k*j)*(k*k*k*k*k*k*k*k*k*k*k*k*k*k*k);
   k=(j-k-k-k-k-k-k-k-k-k-k-k-k-k-k-k);
  }
#include "end"
}
```

10,000 loops through some integer math routines and bit-shifting

GST C

GST's £59.95 budget package arrived the morning after I'd made a credit card order and although service like this appears to be becoming more common it was fun to play with it before breakfast. At the time of writing GST was including a free Fractal generator written in C.

Despite being a limited implementation of C it is a version which is possible to get to grips with before the cornflakes. It uses a window-based shell program which allows you to carry out editing, compilation, assembly, linking and running a program from a command window to which you return at the end of each stage.

Conveniently it also automatically displays any program output in a window without you having to write the Gem stuff needed to set it up and keep it going. This saves a lot of hassle but the price paid is in the larger size of program modules needed.

It comes with loose-leaf documentation describing the separate parts of the system – some TOS and Gem routines were included, but like Lattice needed fuller explanation. The GST editor was the nicest to use – it felt like First Word without the fancy bits, and the Pause on error option during compilation was very useful for examining mistakes one at a time rather than

```
/**************/
/* pointer.c */
/**************/

#include "stdio.h"
#include "osbind.h"

#define COUNT    10000
#define ALLOTTED 128

main()
{
char workarea[ALLOTTED], *ptr;
int i;

#include "start"

for(i=0;i<COUNT;++i)
 {
  ptr=workarea;
  while (ptr<(workarea+ALLOTTED))
   {
    *ptr=' ';
    ++ptr;
   }
 }
#include "end"
}
```

Using pointers to set up a 128 byte array 10,000 times

having to dump an error file to printer.

Although especially fast to compile in RAMdisc this was the least complete version of C but the handbook mentions that it will be enhanced "as a medium-term activity". Floating point and register variables were not available. Despite this it is a friendly way for the C novice to begin getting to grips with the language without depleting the bank balance too much.

With all those windowing overheads the .PRG modules were significantly larger on this C, and at times were slower. Declaring a 16 bit short in place of a 32 bit integer more than halved the Intmath time but only took 0.8 second off the Sieve.

There was no easy way to get the 68000 into supervisor mode in this C, so times are the average of three runs measured on a stopwatch with 0.05 second divisions. In the case of Frame I did a million loops and divided the result by 100.

Conclusions

These products are aimed at different markets so there isn't really a best buy. I felt most comfortable with the completeness and speed of Lattice C but the GST suite's friendliness is a help if you're sticking a toe in the C for the first time.

The Development Pack allows every nook and cranny of the ST to be explored, but you must expect to lose a little sleep over it. The paperwork is essential reading if you intend to write something for the software top ten, but you might prefer to use another C, especially if floating point is needed. You pays your money and you takes your choice. ■

Product: Lattice C
Price: £99.95 inc VAT
Supplier: Metacomco, 26 Portland Square, Bristol BS2 8RZ. Tel: 0272 428781

Product: GST C
Price: £59.95 inc VAT
Supplier: Electric Software, 91 High Street, Longstanton, Cambridge CB4 5BS. Tel: 0954 81991

Product: Development Pack (includes Digital Research C, utilities and a resource construction set for GEM on 5 discs, plus reams of documentation)
Price: £325 plus VAT
Supplier: Atari, Railway Terrace, Slough, Berkshire SL2 5BZ. Tel: 0753 33344.

```
/*************/
/* savage.c */
/*************/

#include "stdio.h"
#include "osbind.h"

#define ILOOP  2500

extern double  tan(), atan(), exp(), log(), sqrt();

main()
{
double a;
int i;

#include "start"

 a = 1.0;
 for( i = 1; i<=(ILOOP-1); i++)
   a = tan(atan(exp(log(sqrt(a*a))))) + 1.0;

printf("a = %20.14e\n", a);

#include "end"
}
```

The final test – complex floating point trig routines are tested 2500 times for accuracy

Time in seconds

	DR	Lattice	GST	STBasic
Sieve Register	4.01 2.32	*4.91 3.19	7.8 N/A	962.5 N/A
Fib	16.44	19.54	21.8	N/A
Intmath	3.72	*19.32	10.2	N/A
Frame	0.06	0.08	0.16	6.1
Pointer	13.3	14.64	28.1	N/A
Float	*14.53	105.08	N/A	*195

** See text for comments*

.PRG size, COMPILE time

	DR	Lattice	GST
Sieve Compile	12598 360	15221 214	31730 279
Empty	6271	10497	21244
Fib	12520	15167	23424
Intmath	13038	15481	24244
Frame	12464	15093	23290
Pointer	12492	15123	23380
Float	*12778	15635	N/A

** See text for comments*

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Trowbridge, Wiltshire. Tel: (02214 67299)
PRESTEL MBX NUMBER 221467299

Bandit should pass the test of time

Program: Time Bandit
Price: £29.95
Supplier: Microdeal, 41 Truro Road, St Austell, Cornwall. Tel: 0726 68020

THE game is based around a race of Time Lords, the creators of the fabled Time Gates. As usual in these situations some of the all powerful beings are corrupt, and use the gates to their own ends, to achieve universal domination and amass unimaginable treasures.

For some reason best known to The Creators you, a Time Bandit, have been asked to go in search of these treasures. Suspecting that your motives are none too altruistic they have offered lots of cash in return for your help.

You can forgive the rather flawed and cliched logic of the background and even the tacky introductory poem if the game is good fun, and it certainly is.

The game opens with a screen that presents various options – one or two player mode, keyboard or joystick and so on. The two player mode is interesting in that it allows either cooperation or feuding between two players.

In the one player mode the game occupies the left half of the screen and with two players each have their own half.

It is dangerously fascinating to watch someone else's action when you ought to be concentrating on your own play. If one bandit shoots the other the dead one can continue the game as a shadow, helping or hindering the offending player. Revenge is sweet, so I'll let you guess which of the two is the more likely.

The Time Gates are essential components of this game. Each one of the 16 contains 16 subsections, all of which must be completed to end the game.

To help you on your way the lands are strewn with pulsating keys. Once picked up these open, logically enough, pulsating locks. Every key will open one lock. When all are opened you can reach the mystical Way Out and the next phase of the adventure.

Game play is relatively simple – shoot anything and everything that moves. This is easy, and as they're all evil guardians you need feel no guilt anyway. Avoiding being shot is more difficult though.

Heroism and derring-do are rewarded with more cubits and often in my case, death. Every thousand cubits buys you an extra life. Is this game entirely based on capitalist principles?

Each gate takes you to a different time or dimension, where a new challenge awaits. Behind each lurk wild shoot-'em-ups, Pac-Man mazes, text adventures and beyond.

The authors, Bill Dunlevy and Harry Lafnear of Michtron Inc have included a great deal of tongue-in-cheek humour, so boredom shouldn't be one of your problems.

Time Bandit bears a striking resemblance to the new arcade game Gauntlet, and no doubt draws some inspiration from this source. The scenery scrolls around you as you move, allowing the playing field to be many times the size of the screen.

It is very easy to get lost in some scenarios, especially with the presence of frustrating one-way doors, so map making is almost essential.

The characters and settings are colourful and fun, the action smooth and fast. It would no doubt be considered stunning on any machine other than the ST, but I'm sure things can get even better – a challenge perhaps?

One word of warning – the game will only run on an ST with a colour monitor. By doing this Microdeal has considerably reduced the market for this game, and if you are the unhappy owner of a monochrome monitor you will be disappointed.

Unless your powers of persuasion are sufficient to acquire a colour version for an evening, or you have the technical skills to work out some way of fooling the ST, Time Bandit will remain out of reach.

Microdeal has clearly put its paws on an excellent product. Just how well Time Bandit will stand the test of time against future products from companies like Rainbird is difficult to tell. I suspect it will pass with flying colours. ■

Sound	7
Graphics	9
Playability	9
Value	7
Overall	9

By Jason Kingsley

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